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VeSPA: The SuperWASP Variable Star Photometry Archive

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VeSPA: The SuperWASP Variable Star Photometry Archive

Adam McMaster, Andrew Norton, Hugh Dickinson, Heidi Thiemann, Ulrich Kolb

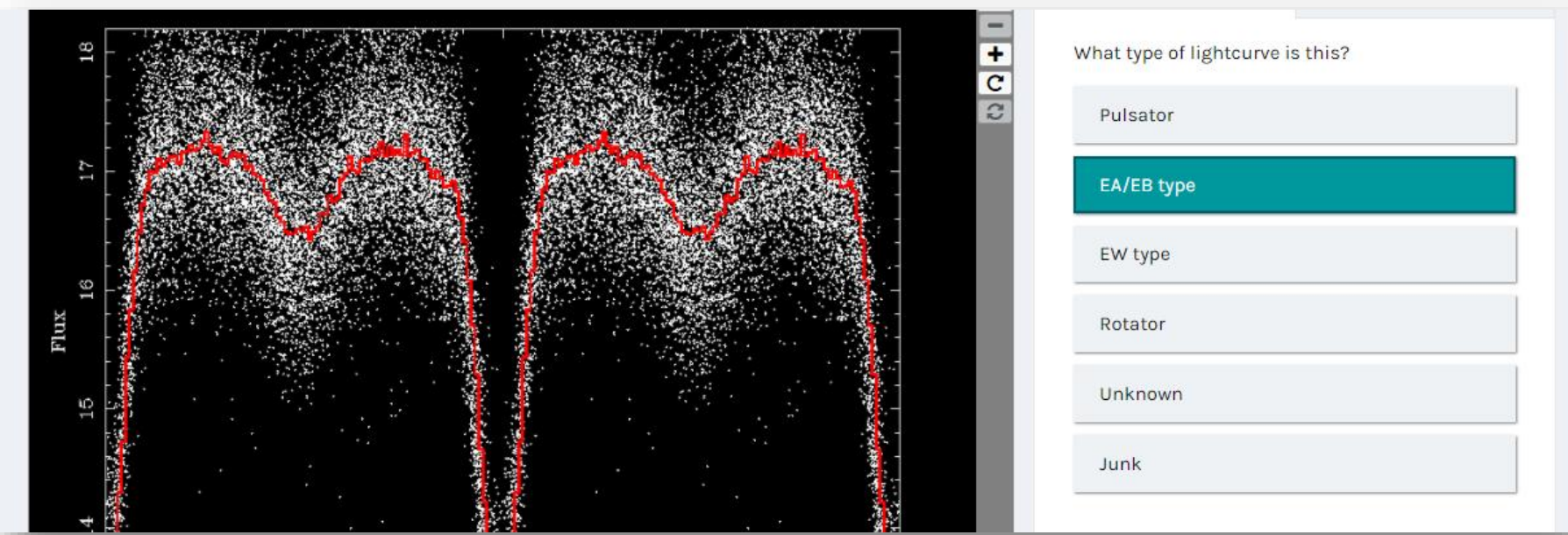
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Abstract

SuperWASP Variable Stars is a Zooniverse citizen science project in which the public label photometric light curve plots showing potential variations in stellar brightness. The volunteers label each plot as one of several types of variable star, or as “unknown” or “junk”. Their labels are combined to produce an aggregated classification. We are publishing the first data release from the project via an interactive website called VeSPA. The results can be searched, filtered, and exported in CSV format. Raw FITS data is available to download.

Zooniverse Citizen Science Project

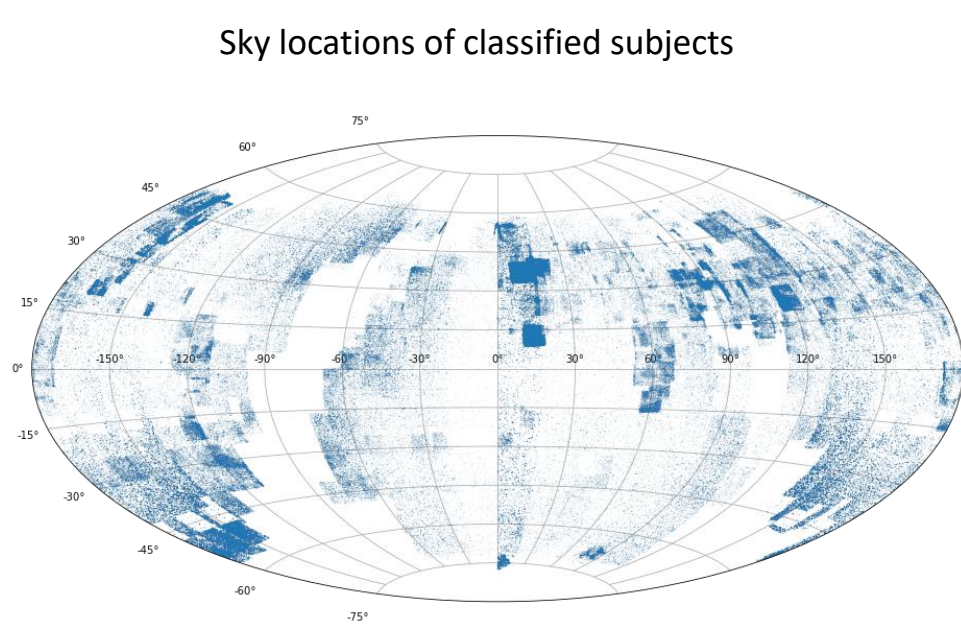
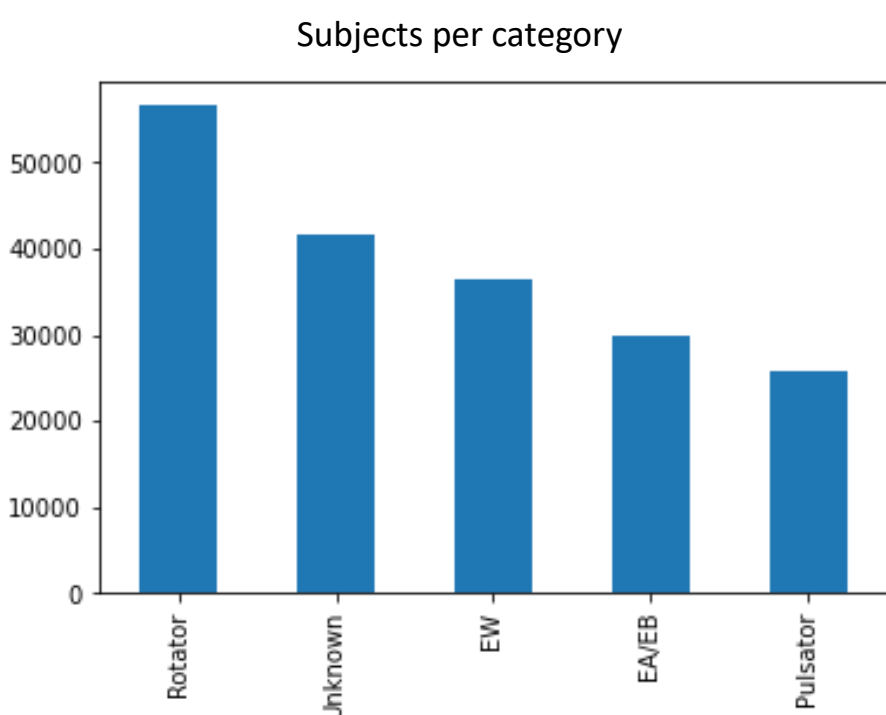
Volunteers are presented with a plot of the source’s brightness. This plot was produced by taking several years’ worth of observations and folding them at a candidate time period. This makes obvious any periodic variations in the source’s brightness. The red line shows the bin-wise mean. Based on the shape of the curve (see rightmost column) the volunteers choose a variable star type: pulsator; EA/EB type (detached eclipsing); EW type (contact eclipsing); rotator. They can also choose “unknown” for anything that looks periodic but doesn’t fit any category, or “junk” for spurious plots/noise. Classifications from multiple people are combined to produce a consensus classification for each source.



Over 1 million classifications

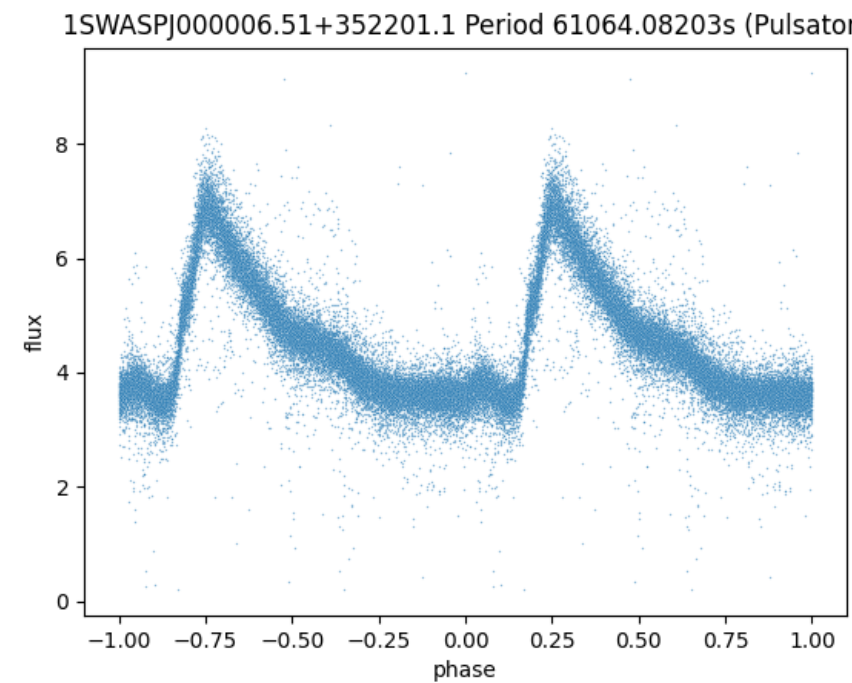
Over 190,000 candidate stars

Classified by citizen scientists



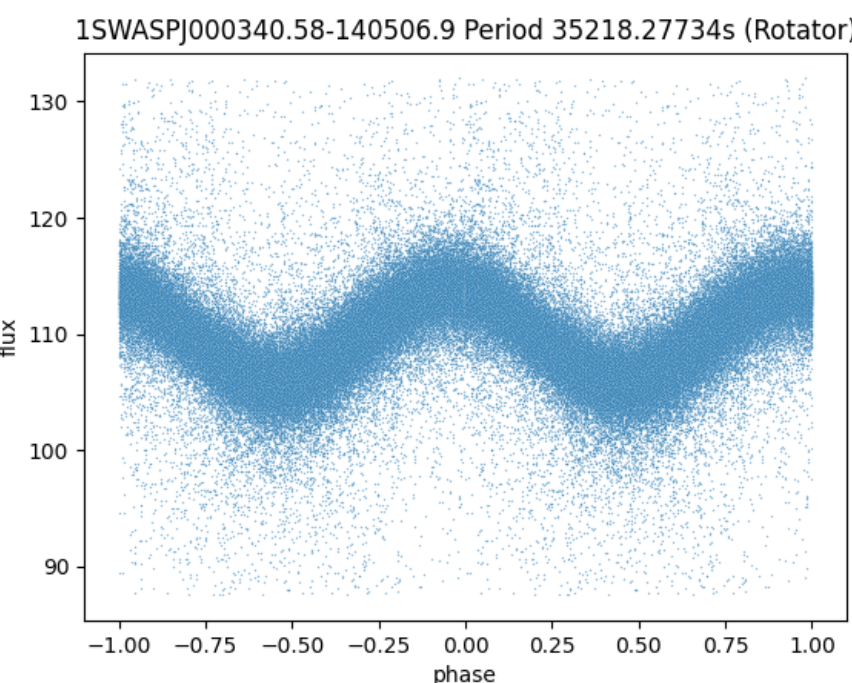
Pulsators

The star is physically pulsating because it is unstable. It produces more heat than it can radiate. Heat builds up and the star expands. It gets brighter as it expands, causing a sudden peak in the light curve. The star contracts again as it cools.



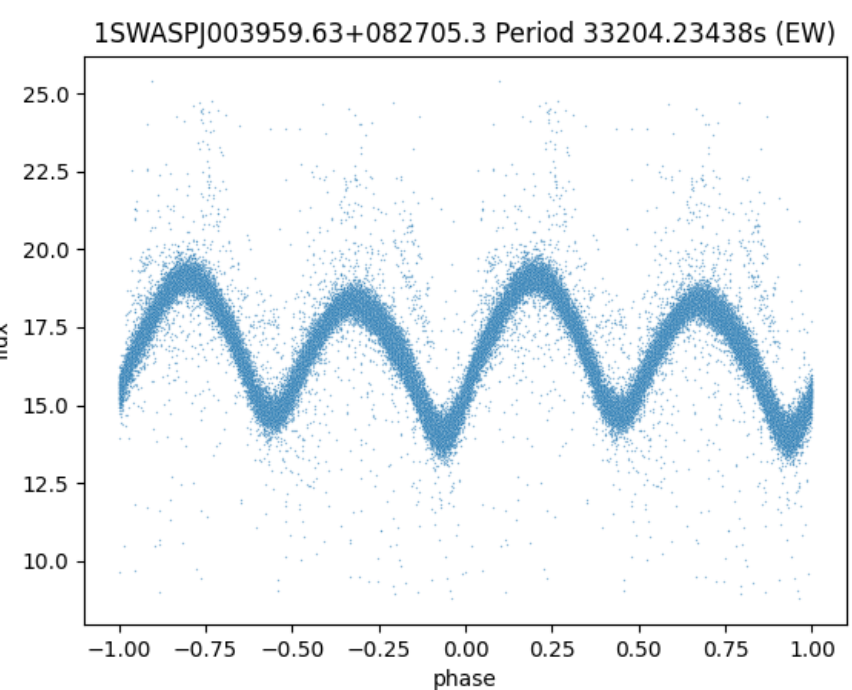
Rotators

Some stars have a distorted shape or a significant coverage of star spots. These can cause continuous variations in the light curve as the star rotates.



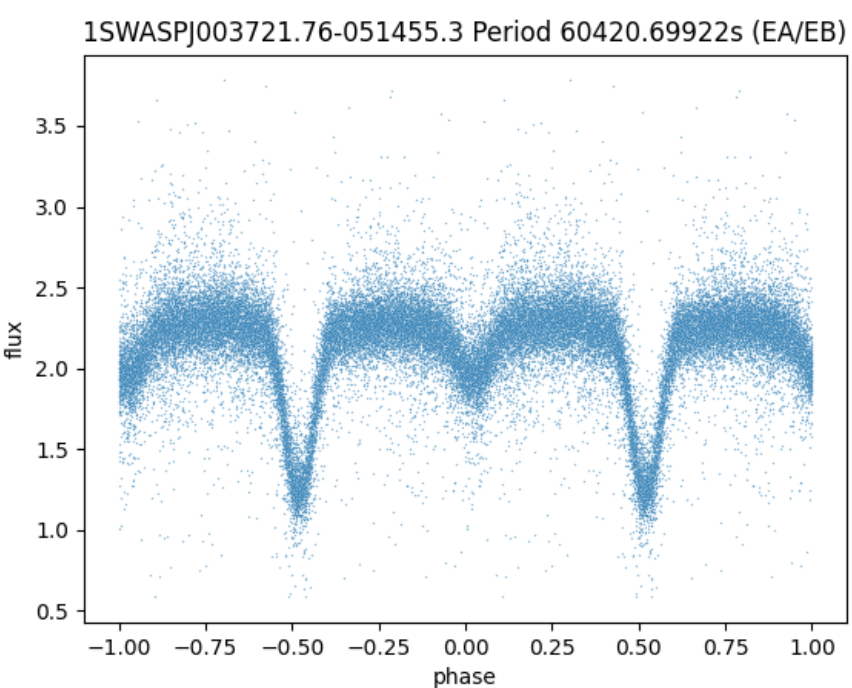
Contact Eclipsing

Two stars orbit each other so closely that they’re touching. They happen to be lined up so that they take it in turns to pass in front of each other from our point of view. They’re not the same brightness, so we see an alternating pattern of peaks and dips in the light curve as they block each other’s light.



Detached Eclipsing

Two stars orbit each other at a distance. As above they happen to be lined up so that they periodically block each other from our perspective. Changes in the light curve are less continuous than for contact binaries.



Types of Variable Star

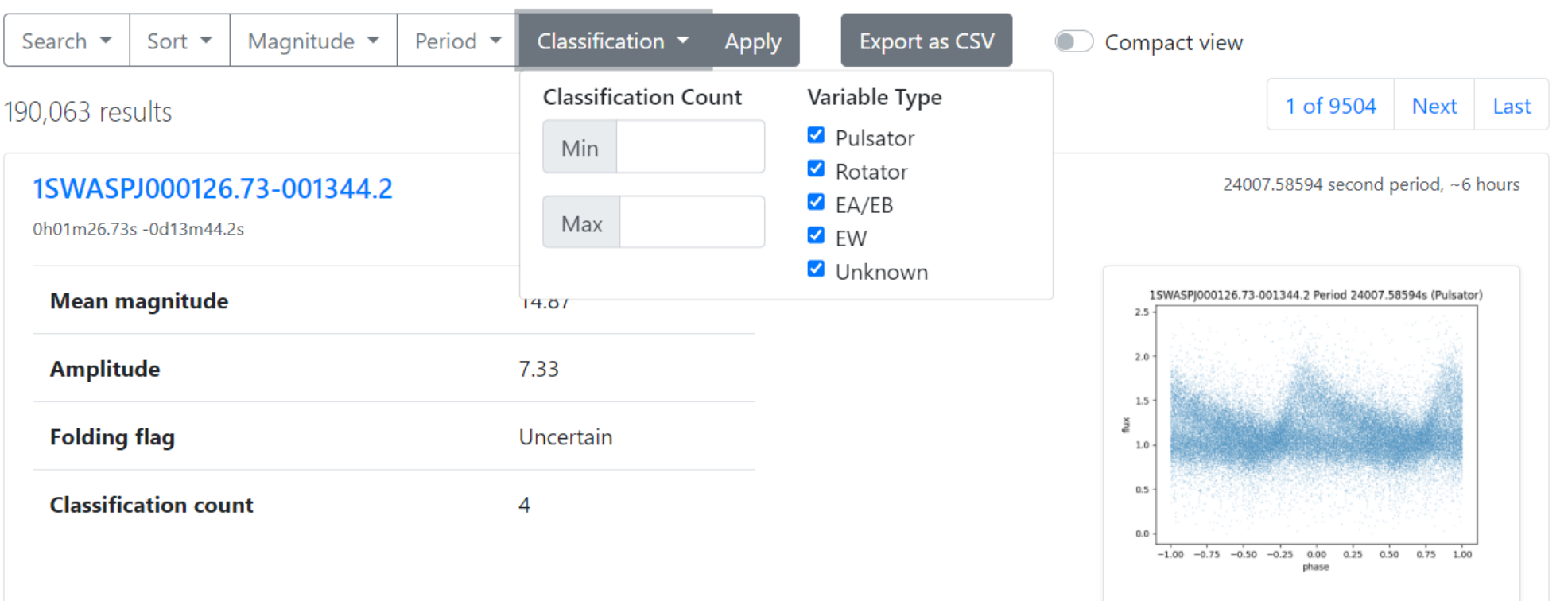
What is VeSPA?

The Variable Star Photometry Archive, or VeSPA, is a website where we are publishing the results from the project so far. The first data release comprises consensus classifications of 190,063 light curves (see above, left): 25,730 pulsators; 56,582 rotators; 36,382 contact eclipsing binaries; 29,882 detached eclipsing binaries; and, 41,541 unknown sources which seem to have periodic variations. The archive can be searched by coordinates or by object name, and a range of filtering options can be applied to restrict results to only those objects which are of interest (see right). Results can be exported in CSV format for offline use and we encourage other astronomers to make use of this data.

The archive currently includes results from over 1 million individual classifications of over 500,000 sources from across the sky (see above, right). This represents about a third of the total catalogue. We intend to keep the archive updated with new results and refined classifications as more results come in from the Zooniverse.

To read more about our results see Thiemann+ 2021 (doi.org/10.1093/mnras/stab140).

Browse the Catalogue



Available soon at
superwasp.org



@SuperWASP_stars @AstroAdamMc